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09/816,603	03/23/2001	Mark Lynn Jenson	1327.009US1	6175

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Schwegman, Lundberg,
Woessner & Kluth, P.A.
P.O. Box 2938
Minneapolis, MN 55402

EXAMINER

ALEJANDRO, RAYMOND

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 09/17/2003

12

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n No.

09/816,603

Applicant(s)

JENSON, MARK LYNN

Examiner

Raymond Alejandro

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11-43 is/are pending in the application.
- 4a) Of the above claim(s) 13, 16, 17, 25-30, 34-38 and 41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11-12, 14-15, 18-24, 31-33, 39-40 and 42-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 March 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8 and 11. 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 09/04/03 has been entered.

This communication is responsive to the foregoing communication. The applicant has overcome the 35 USC 103 rejection. However, the claims (including newly submitted claim 43) are rejected again over new art as seen below. In addition, the indicated allowability of claims 11-12, 14-15, 18-20 and 32-33 is herein withdrawn in view of the newly discovered reference(s). Rejections based on the newly cited reference(s) follow:

Election/Restrictions

2. This application contains claims 13, 16-17, 25-30, 34-38 and 41 drawn to an invention nonelected with traverse in Paper No. 3a and 4. A complete reply to the rejection must include cancelation of nonelected claims or other appropriate action.

3. With respect to applicant's argument that claims 13, 16 and 17 are dependent claims that depend on allowed claims 12 and/or 11 and they cannot be restricted at this point, the examiner wishes to point out that the allowability of such claims has been withdrawn and thus, it does not provide the contended-allowed genus claim linking the species of the dependent claims.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 11-12, 14-15, 18-24, 31, 33, 39-40 and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ovshinsky et al 5411592 in view of Goldner et al 5189550.

The instant application is directed to system for making a thin-film device wherein the claimed inventive concept comprises the specific deposition means (station) that deposits the layers.

With respect to claims 11, 21, 22 and 31:

Ovshinsky et al disclose an apparatus for deposition of thin-film solid state batteries (title) comprising a multi-chambered deposition apparatus for depositing battery materials onto substrate material (abstract/col 6, lines 25-43). The apparatus includes at least three distinct evacuable deposition chambers, interconnected in series; the first deposition chamber is adapted to deposit a layer of battery electrode material onto the substrate (abstract/col 6, lines 25-43). The second deposition chamber is adapted to deposit a layer of electrolyte material onto the layer of the battery electrode material deposited in the first chamber. The third deposition chamber is adapted to deposit another layer of battery electrode material onto the electrolyte layer (abstract/col 6, lines 25-43). Initially, the substrate passes to the first deposition chamber then it is transported to the second chamber, next the substrate is passed through another gas gate into the third deposition chamber (col 11, lines 58 to col 12, line 7). *Thus, the process is continuous.*

Each electrochemical cell includes a thin-film negative electrode layer, a thin-film positive electrode layer and a thin-film electrolyte layer (col 9, lines 25-28). The chambers are

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specifically adapted to deposit battery materials onto the substrate (col 11, lines 50-58). *The energy conversion device is the battery itself which is being deposited over the substrate in the form of different layers.*

The deposition chambers are preferably adapted to deposit materials by at least one method selected from the group consisting of chemical vapor deposition, microwave plasma enhanced chemical vapor deposition, sputtering, laser ablation among them (col 7, lines 65 to col 8, line 3). *It is noted that sputtering and laser ablation are ion-assist energy deposition techniques.*

As to claim 12:

It is disclosed that a product variation is the deposition of the thin-film batteries onto substrates on the opposite side of thin-film silicon solar cells (photovoltaic cells) to integrate the collection and storage of solar energy (col 11, lines 39-43).

As to claim 14:

It is disclosed that the chambers are physically interconnected in series (col 6, lines 29-31) and the deposition chambers are interconnected by gas gates such that the substrate material is allowed to proceed from one deposition chamber to the next, while maintaining gaseous segregation between the chambers (col 6, lines 40-44).

In reference to claim 15:

It is taught that a third embodiment comprises an evacuable payout chamber which is physically connected in series to the first deposition chamber; the payout chamber holds a roll of substrate material (flexible material as it has been rolled) which is unrolled and passed to the first deposition chamber (col 6, line 65 to col 7, line 2).

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On the matter of claims 18-19, 23 and 39:

Ovshinsky et al disclose that the substrate may be formed from an electrically conductive metal (rigid material) or from an electrically insulating polymer (col 9, lines 3-6). *Thus, the rolled substrate material is understood to be a continuous plastic sheet.* The use of an elongated web of substrate material is disclosed (col 13, lines 13-17).

With respect to claims 24 and 40:

It is disclosed that a second embodiment comprises a deposition apparatus for depositing single or multi-celled batteries upon precut substrates (wafers), that is a substrate which is of relatively limited length and width dimensions when compared to rolls of substrate web which can be as long as 2000 ft or more (col 12, lines 35-46).

As far as claim 32 (see also rejection below):

Ovshinsky et al disclose that for lithium ion system, the positive electrode layer can be formed from a material such as metal oxides and lithiated metal oxides compound such as LiCoO_4 (col 10, lines 30-34).

Regarding claim 33:

It is disclosed that a second embodiment comprises an apparatus including an substrate insertion chamber which is physically interconnected in series to the first deposition chamber; the insertion chamber is adapted to hold one or more individual substrates and pass them to the first deposition chamber (col 6, lines 44-64).

Ovshinsky et al disclose an apparatus for deposition of thin-film batteries according to the foregoing. However, Ovshinsky et al do not expressly disclose the deposition station

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supplying the amount of ion-assist energy to aid in crystalline layer formation while controlling stoichiometry of the crystalline layer and the specific ion energy.

As to claims 11, 20, 21, 22 and 43:

Goldner et al disclose ion-beam based depositions of coatings or thin film coatings for solid state storage batteries wherein the films are formed by an ion-assisted deposition process (ABSTRACT). Goldner et al's purpose is to provide a method for depositing high mass density device materials upon substrates by means of a rapid deposition process that does not require a heated substrate to achieve the desired effects (COL 2, lines 8-13). It is disclosed that the device coatings are prepared on substrates by an RF deposition process which includes ion-assisted depositions; in this case, the first conducting layer, counter electrode layer, ion conducting layer, another layer and a second conducting layer are each deposited on the room temperature substrates by bombardment of the material accompanied by an ion beam energy of 400 e-volts or less (COL 2, lines 15-25). It is also disclosed that the starting materials for the mixed oxide components are prepared in excess of stoichiometric in composition to insure the selective ion and electron transport properties (COL 2, lines 45-52). *Thus, the language "in excess of stoichiometry" do encompass a degree of controlled stoichiometry, that is to say, the excess stoichiometry is more than the theoretical stoichiometry.*

In view of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to use the deposition station supplying the amount of ion-assist energy to aid in crystalline layer formation while controlling stoichiometry of the crystalline layer of Goldner et al in the deposition system of Ovshinsky et al as Goldner et al teach that ion-assisted energy deposition allows to deposit high mass density device materials upon substrates

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by means of a rapid deposition process that does not require a heated substrate to achieve the desired effect. Thus, the long heating and cooling cycles which are not conducive to commercial production and which also eliminates most commercially available plastic is avoided, that is, such process is not longer necessary. As to the controlled stoichiometry during deposition, it would have been obvious to one skilled in the art at the time the invention was made to control the stoichiometry during deposition of Ovshinsky et al as taught by Goldner et al as because Goldner et al teach that by controlling stoichiometry the selective ion and electron transport properties are insured.

6. Claims 11-12, 14-15, 18-24, 31, 33, 39-40 and 42-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ovshinsky et al 5411592 in view of the Martin et al's publication "Modification of the optical and structural properties of dielectric films by ion-assisted deposition" (hereinafter referred to as "Martin et al")

With respect to claims 11, 21, 22 and 31:

Ovshinsky et al disclose an apparatus for deposition of thin-film solid state batteries (title) comprising a multi-chambered deposition apparatus for depositing battery materials onto substrate material (abstract/col 6, lines 25-43). The apparatus includes at least three distinct evacuable deposition chambers, interconnected in series; the first deposition chamber is adapted to deposit a layer of battery electrode material onto the substrate (abstract/col 6, lines 25-43). The second deposition chamber is adapted to deposit a layer of electrolyte material onto the layer of the battery electrode material deposited in the first chamber. The third deposition chamber is adapted to deposit another layer of battery electrode material onto the electrolyte layer (abstract/

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col 6, lines 25-43). Initially, the substrate passes to the first deposition chamber then it is transported to the second chamber, next the substrate is passed through another gas gate into the third deposition chamber (col 11, lines 58 to col 12, line 7). *Thus, the process is continuous.* Each electrochemical cell includes a thin-film negative electrode layer, a thin-film positive electrode layer and a thin-film electrolyte layer (col 9, lines 25-28). The chambers are specifically adapted to deposit battery materials onto the substrate (col 11, lines 50-58). *The energy conversion device is the battery itself which is being deposited over the substrate in the form of different layers.*

The deposition chambers are preferably adapted to deposit materials by at least one method selected from the group consisting of chemical vapor deposition, microwave plasma enhanced chemical vapor deposition, sputtering, laser ablation among them (col 7, lines 65 to col 8, line 3). *It is noted that sputtering and laser ablation are ion-assist energy deposition techniques.*

As to claim 12:

It is disclosed that a product variation is the deposition of the thin-film batteries onto substrates on the opposite side of thin-film silicon solar cells (photovoltaic cells) to integrate the collection and storage of solar energy (col 11, lines 39-43).

As to claim 14:

It is disclosed that the chambers are physically interconnected in series (col 6, lines 29-31) and the deposition chambers are interconnected by gas gates such that the substrate material is allowed to proceed from one deposition chamber to the next, while maintaining gaseous segregation between the chambers (col 6, lines 40-44).

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In reference to claim 15:

It is taught that a third embodiment comprises an evacuable payout chamber which is physically connected in series to the first deposition chamber; the payout chamber holds a roll of substrate material (flexible material as it has been rolled) which is unrolled and passed to the first deposition chamber (col 6, line 65 to col 7, line 2).

On the matter of claims 18-19, 23 and 39:

Ovshinsky et al disclose that the substrate may be formed from an electrically conductive metal (rigid material) or from an electrically insulating polymer (col 9, lines 3-6). *Thus, the rolled substrate material is understood to be a continuous plastic sheet.* The use of an elongated web of substrate material is disclosed (col 13, lines 13-17).

With respect to claims 24 and 40:

It is disclosed that a second embodiment comprises a deposition apparatus for depositing single or multi-celled batteries upon precut substrates (wafers), that is a substrate which is of relatively limited length and width dimensions when compared to rolls of substrate web which can be as long as 2000 ft or more (col 12, lines 35-46).

As far as claim 32 (see also rejection below):

Ovshinsky et al disclose that for lithium ion system, the positive electrode layer can be formed from a material such as metal oxides and lithiated metal oxides compound such as LiCoO_4 (col 10, lines 30-34).

Regarding claim 33:

It is disclosed that a second embodiment comprises an apparatus including an substrate insertion chamber which is physically interconnected in series to the first deposition chamber;

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the insertion chamber is adapted to hold one or more individual substrates and pass them to the first deposition chamber (col 6, lines 44-64).

Ovshinsky et al disclose an apparatus for deposition of thin-film batteries according to the foregoing. However, Ovshinsky et al do not expressly disclose the deposition station supplying the amount of ion-assist energy to aid in crystalline layer formation while controlling stoichiometry of the crystalline layer and the specific ion energy.

As to claims 11, 20, 21, 22 and 43:

Martin et al describe the ion assisted deposition of films on both heated and unheated substrates; wherein the films were prepared by electro-beam evaporation accompanied by irradiation with 600 e-volt beam (EXPERIMENT). It is also described the deposition of films with and without Ar ions (RESULTS and CONCLUSIONS) and crystallization was observed (CRYSTAL STRUCTURE).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the deposition station supplying the amount of ion-assist energy to aid in crystalline layer formation while controlling stoichiometry of the crystalline layer of Martin et al in the deposition system of Ovshinsky et al as Martin et al makes known that the ion-assisted deposition is suitable for structural properties modifications of film material devices. Further, Martin et al reveals that the influence of the ion kinetic energy on film formation ranges from simple substrate cleaning resulting in enhanced adhesion to morphological changes the stimulation of epitaxial growth as well as satisfactorily changing film stress, crystal structure and composition. It is also concluded that ion-assisted deposition leads to films of higher density, greater stability and refractive index than those deposited without ions.

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7. Claims 11, 20-22 and 43 rejected under 35 U.S.C. 103(a) as being unpatentable over the Japanese document JP 62-044960 in view of Goldner et al 5189550.

The JP'960 document discloses a thin film secondary battery manufacturing equipment by employing a cluster ion beam deposition unit comprising cluster gun section, plural cluster guns, plural crucibles and plural nozzles to prepare positive electrode, electrolyte and negative electrode material (PURPOSE) wherein the equipment comprises a verger, cluster gun sections to form a crystallized thin film of a disulfide material on the substrate section; and thereafter, crystallized thin film electrolyte is formed thereon and a cluster gun section is used to form Li thin film on the substrate (CONSTITUTION).

The JP'960 document discloses a thin film manufacturing equipment according to the foregoing. However, the JP'960 does not disclose ion-assist deposition with substantially heating the substrate.

Goldner et al disclose ion-beam based depositions of coatings or thin film coatings for solid state storage batteries wherein the films are formed by an ion-assisted deposition process (ABSTRACT). Goldner et al's purpose is to provide a method for depositing high mass density device materials upon substrates by means of a rapid deposition process that does not require a heated substrate to achieve the desired effects (COL 2, lines 8-13). It is disclosed that the device coatings are prepared on substrates by an RF deposition process which includes ion-assisted depositions; in this case, the first conducting layer, counter electrode layer, ion conducting layer, another layer and a second conducting layer are each deposited on the room temperature substrates by bombardment of the material accompanied by an ion beam energy of 400 e-volts or less (COL 2, lines 15-25). It is also disclosed that the starting materials for the mixed oxide

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components are prepared in excess of stoichiometric in composition to insure the selective ion and electron transport properties (COL 2, lines 45-52). *Thus, the language "in excess of stoichiometry" do encompass a degree of controlled stoichiometry, that is to say, the excess stoichiometry is more than the theoretical stoichiometry.*

In view of these disclosures, it would have been obvious to one skilled in the art at the time the invention was made to use ion-assist deposition with substantially heating the substrate of Goldner et al in the manufacturing equipment of the JP'960 document as Goldner et al teach that ion-assisted energy deposition allows to deposit high mass density device materials upon substrates by means of a rapid deposition process that does not require a heated substrate to achieve the desired effect. Thus, the long heating and cooling cycles which are not conducive to commercial production and which also eliminates most commercially available plastic is avoided, that is, such process is not longer necessary. As to the controlled stoichiometry during deposition, it would have been obvious to one skilled in the art at the time the invention was made to control the stoichiometry during deposition of the JP'960 document as taught by Goldner et al as because Goldner et al teach that by controlling stoichiometry the selective ion and electron transport properties are insured.

8. Claims 11, 20-22 and 43 rejected under 35 U.S.C. 103(a) as being unpatentable over the Japanese document JP 62-044960 in view of the Martin et al's publication "Modification of the optical and structural properties of dielectric films by ion-assisted deposition" (hereinafter referred to as "Martin et al").

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The JP'960 document discloses a thin film secondary battery manufacturing equipment by employing a cluster ion beam deposition unit comprising cluster gun section, plural cluster guns, plural crucibles and plural nozzles to prepare positive electrode, electrolyte and negative electrode material (PURPOSE) wherein the equipment comprises a verger, cluster gun sections to form a crystallized thin film of a disulfide material on the substrate section; and thereafter, crystallized thin film electrolyte is formed thereon and a cluster gun section is used to form Li thin film on the substrate (CONSTITUTION).

The JP'960 document discloses a thin film manufacturing equipment according to the foregoing. However, the JP'960 does not disclose ion-assist deposition with substantially heating the substrate.

Martin et al describe the ion assisted deposition of films on both heated and unheated substrates; wherein the films were prepared by electro-beam evaporation accompanied by irradiation with 600 e-volt beam (EXPERIMENT). It is also described the deposition of films with and without Ar ions (RESULTS and CONCLUSIONS) and crystallization was observed (CRYSTAL STRUCTURE).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the deposition station supplying the amount of ion-assist energy to aid in crystalline layer formation while controlling stoichiometry of the crystalline layer of Martin et al in the manufacturing equipment of the JP'960 document as Martin et al makes known that the ion-assisted deposition is suitable for structural properties modifications of film material devices. Further, Martin et al reveals that the influence of the ion kinetic energy on film formation ranges from simple substrate cleaning resulting in enhanced adhesion to morphological changes the

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stimulation of epitaxial growth as well as satisfactorily changing film stress, crystal structure and composition. It is also concluded that ion-assisted deposition leads to films of higher density, greater stability and refractive index than those deposited without ions.

9. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ovshinsky et al 5411592 in view of: a) Goldner et al 5189550, or b) Martin et al's publication "Modification of the optical and structural properties of dielectric films by ion-assisted deposition" as applied to claim 11 above, and further in view of Matsui et al 5558953.

Ovshinsky et al-Goldner et al or Ovshinsky et al-Martin et al are applied, argued and incorporated herein for the reasons above. In addition, the preceding references do not disclose the specific material LiCoO_2 .

Matsui et al disclose that as a positive electrode (cathode) of the lithium battery, it is preferable to use an active material such as LiCoO_2 (col 4, lines 48-57).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the specific material LiCoO_2 to form the second layer of the layer-deposited battery of Ovshinsky et al-Goldner et al or Ovshinsky et al-Martin et al as Matsui et al disclose that it is preferable to use LiCoO_2 as an active material because such a compound is capable of imparting a discharge voltage of 4V level.

Allowable Subject Matter

10. The indicated allowability of claims 11-12, 14-15, 18-20 and 32-33 is withdrawn in view of the newly discovered reference(s) as discussed above. Rejections based on the newly cited reference(s) was presented in this office action.

Response to Arguments

11. Applicant's arguments with respect to claims 21-24, 31, 39-40 and 42 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (703) 306-3326. The examiner can normally be reached on Monday-Thursday (8:30 am - 7:00 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Raymond Alejandro
Examiner
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